



# Case Examples of Managing Overallocated Groundwater Systems



Occasional Paper



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#### NATURAL RESOURCE MANAGEMENT STANDING COMMITTEE

In June 2001 the Australian Commonwealth and State/Territory governments created several new Ministerial Councils from the amalgamation and redirection of the work of several existing Councils. These changes saw the winding up of the Agriculture and Resource Management Council of Australia and New Zealand, the Australian and New Zealand Environment and Conservation Council and the Ministerial Council on Forestry, Fisheries and Aquaculture, and the establishment of several new Councils among which is the Natural Resource Management Ministerial Council. The objective of this new Council is:

*“to promote the conservation and sustainable use of Australia’s natural resources”.*

The Natural Resource Management Ministerial Council, which consists of Australian Federal, State/Territory and New Zealand Ministers responsible for natural resources management policy issues has principal responsibility for, amongst other things, water issues.

The Council is supported by a permanent Standing Committee, titled the Natural Resource Management Standing Committee. Membership of the Standing Committee comprises relevant heads/CEOs of Commonwealth, State/Territory and New Zealand government agencies.

The Standing Committee agreed to release this paper, *Case Examples of Managing Over-allocated Groundwater Systems* as a ‘best practice manual’ for discretionary use by jurisdictions, at its second meeting in November 2001.

#### FURTHER INFORMATION

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# Case Examples of Managing Over-allocated Groundwater Systems

## *New South Wales*

### NSW Situation

In NSW there are about 18 groundwater systems where total allocations exceed the current estimate of sustainable yield.

State policy is to provide 30% of groundwater recharge to groundwater dependent ecosystems as a default value. After negotiations with stakeholder groups and subject to agreement from the Minister, groundwater committees may vary this amount up or down to better meet the requirements of dependent ecosystems or extractive users. Sustainable yield estimates are being progressively refined in priority aquifers through a combination of numerical modelling and assessment of ecosystem water needs.

With the exception of the Great Artesian Basin (sandstone aquifer) all other over-allocated aquifers occur in unconsolidated alluvial sediments (sands and gravels) associated with the flood plains of major river systems.

Four examples over-allocated systems are given below:

<b>Aquifer Name</b>	<b>Sustainable Yield ML/yr</b>	<b>Total Allocation ML/yr</b>	<b>Total Abstraction ML/yr</b>
Lower Namoi	95 000	213 264	118 849
Lower Murrumbidgee	226 000	384 376	184 063
Lower Murray	136 000	332 976	103 170
Lower Lachlan	94 000	237 452	28 011

Only one aquifer in the State (Lower Namoi) has groundwater usage exceeding the sustainable yield. It is showing signs of being progressively mined. The remainder is a concern because of the potential to be overdrawn unless over-allocations are addressed.

Groundwater Committees have been set up for priority aquifers to develop management plans. Committees have suggested several options on the vexed issue of over-allocation. The Minister has not yet decided on a preferred approach. Suggestions include:

- across-the-board cutbacks in entitlements, down to sustainable yield;
- across-the-board cutbacks in entitlements, down to 25% above sustainable yield, then use announced allocations to control usage to sustainable yield;
- cut entitlements back to sustainable yield but give a larger weighting to ‘used water’ over unused entitlement;
- remove all ‘ghost’ entitlements<sup>1</sup> before commencing across-the-board cuts; and

<sup>1</sup> A ‘ghost’ entitlement is the difference between what a bore(s) is capable of pumping and the licensed entitlement. The entitlement is not capable of being utilised unless additional infrastructure is authorised and installed.

- leave entitlements intact but limit access to entitlements through annual announcements.

It is apparent that some Groundwater Committees are struggling with making a clear recommendation to the Minister on the preferred approach to reducing entitlements. Although it is early days with some committees it is likely that the Minister will need to make this decision in most instances. The *Water Management Act 2000* requires that the process for dealing with over-allocation be determined for priority aquifers by end 2001.

## *Western Australia*

### Collie Basin case example (WA)

Groundwater extraction as a consequence of coal mine dewatering and power station cooling water demands in the Collie Basin resulted in substantial overdraw of the resource with the consequent summer drying of groundwater fed river pools. This resulted in unacceptable loss of both ecological values and social amenity. Without management intervention, recovery of the system has been calculated as needing over 100 years, well beyond the expected life of power generation in the Basin. Community concern elevated the matter to Cabinet level in the mid-1990s and a stakeholder based advisory group was appointed by the Government to develop a strategy for management intervention.

As a consequence of the strategy, industry has been required to substantially modify its use of water in the Basin. This includes the development of more expensive alternative water supply sources for power generation, installation of water treatment and conservation systems, and construction of an artificial water supplementation system for the river pools. These measures have resulted in substantial expense to the industry and the State. However, even with this intervention, it is expected that it will be at least another 30 years before the system returns to an acceptable equilibrium.

## *Queensland*

### Pioneer Valley Alluvial Aquifers case example (Qld)

Alluvial aquifers of the Pioneer River valley are over allocated. Total allocation is 71 000 ML/yr. Extraction of between 17 000 and 40 000 ML/yr for irrigation, town water supply and some industrial purposes has resulted in loss of access to groundwater during drought periods in some up-valley areas and seawater intrusion in coastal areas. There is some evidence that seawater intrusion may have had an impact on groundwater dependent ecosystems at a few localities. Without management intervention, many users would lose access to groundwater for much of the time and seawater intrusion and related impacts on groundwater dependent ecosystems would expand.

The management response since 1992 involved application of pumping restrictions over much of the Pioneer River valley with the most stringent restrictions applying in near

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coast areas. Restrictions of varying severity that limit pumping times are being applied after consultation with water users and are aimed at maintaining water levels above critical levels. Meters have also been installed. A recent decision was taken to prepare a Water Resource Plan to provide the long-term water allocation and management framework for the alluvial aquifers. Incentives for implementing more efficient on-farm water use practices have also been made available. Extensive monitoring and reporting of water levels and seawater intrusion supports the aquifer management approach.

Reduced levels of use resulting from restrictions have maintained access to some water for most users during peak demand periods and arrested seawater encroachment in most coastal areas. Water quality has improved in areas impacted by seawater but is expected to take some years to return to acceptable levels.

#### Bundaberg Alluvial Aquifers case example (Qld)

Groundwater in shallow alluvial aquifers near Bundaberg has been overdeveloped for irrigation, town water supply and some industrial purposes. Annual yield is estimated to be 56 000 ML and use ranges from 33 000 to 71 000 ML/yr. Annual allocations total 65 000 ML. In areas adjacent to the coast, seawater intrusion has occurred during peak demand periods since the 1960s with consequent loss of access to water.

The management response to seawater encroachment in the 1960s involved substitution of surface water for groundwater in some coastal areas as part of the Bundaberg Irrigation Scheme beginning in the 1970s, metering and reduced water use through a system of announced allocations. The annual allocation system has operated since 1989 and involves groundwater modelling to predict water levels in key monitoring bores and consultation with water users on the allocation to be announced. Annual announced allocations vary from zone to zone. A recent management response has been to commence preparation of a Water Resource Plan for the aquifer system. Incentives for implementing more efficient on-farm water use practices have also been made available.

Monitoring and reporting aquifer water levels and seawater intrusion to the community provides the final component of the management approach. Encroachment of seawater has been halted. In isolated localities there has been marginal improvement in water quality.

#### Central Lockyer Valley case example (Qld)

Groundwater in alluvial aquifers of the Central Lockyer is used for irrigation of horticulture and fodder crops. Annual extraction ranges from 8 000 to 18 000 ML and the annual yield is estimated to be 15 000 ML/yr. Overdevelopment in some areas has resulted in depleted groundwater levels and loss of or reduced access to water. In other areas overdevelopment has caused a deterioration of groundwater quality because of encroachment of saline water from underlying bedrock aquifers. Intervention was required in order to ensure further loss of socio-economic values is avoided. There are a small number of surface water storages that are also impacted.

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Management response has involved provision of surface water from two major off-stream storages to supplement stream recharge and provide some surface water supplies. Some groundwater substitution has also occurred. A small number of weirs have been built for recharge purposes. In addition meters have been installed and allocations are being issued so that the system is not over-allocated. Allocation limits are being set on the basis of technical studies and after close community consultation. A system of announced allocations will be introduced to manage demand during peak periods. Incentives have been made available for implementing more efficient on-farm water use practices. A recent management response has been to commence planning for the preparation of a Water Resource Plan for the Brisbane/Lockyer/Pine River and groundwater systems that would include the Central Lockyer aquifer system.

Extensive monitoring of water levels and reporting of key sites provides the necessary feedback to managers and the community. In recent years water levels in some areas that are removed from recharge sources have remained low and in areas near streams there has been some recovery of water levels. Most of these responses are cyclic and reflect seasonal conditions. The full impact of recent management approaches has not yet been observed in the groundwater system.

#### Upper Condamine River Valley case example (Qld)

The Condamine River Valley is located in the headwaters of the Murray-Darling system in Queensland. Groundwater extraction that ranges from 25 000 – 55 000 ML/yr is used for irrigation and town water supply purposes and has resulted in significant water level decline over the central part of the alluvial aquifer. The yield of the aquifer within the groundwater management area is estimated to be 27 000 ML/yr compared with current allocation of 72 000 ML/yr.

The impact of this level of use has been a reduction of groundwater levels in many areas of the aquifer system. Water user response has been to deepen bores and endure higher pumping costs. There have been no impacts on water quality or stream base flow.

The management response was to cease allocating groundwater in 1969 and subsequently to meter bores. The North Branch Scheme was implemented as a means of substituting surface water for groundwater. This together with some claw back of allocations reduced allocations from 79 000 ML to the current 72 000 ML/yr. A system of announced annual allocations that is intended to limit use to 70% of allocation together with a system of carry overs, forward draws and temporary transfers has been introduced to control use and provide some flexibility in being able to distribute demand. Announced allocations that involve setting the level of use are made on the basis of close community consultation.

While 70% announced allocation is still higher than the sustainable yield, this level was agreed upon as a first step in the process of reducing use to a more sustainable level on the basis of economic considerations. Incentives have recently been made available for implementing more efficient on-farm water use practices. Extensive monitoring of

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water levels and reporting of key sites provides the necessary feedback to managers and the community.

The rate of water level decline in the groundwater system has been reduced and arrested in some areas.

## *South Australia*

### Hundred of Stirling case example (SA)

The Hundred of Stirling is one of Australia's prime areas for production of small seeds for export. Irrigation commenced in 1969, utilising fresh-brackish quality groundwater. While salinities were higher than normal for irrigation, they were suitable for seed production.

However, salinity levels in the groundwater source have risen significantly as a result of salt recycling<sup>2</sup>. Approaches to the community in the early 1990s regarding the unsustainable rates of salinity increase resulted in a community response for more monitoring and investigation of more salt tolerant seed varieties. Following continuing rises in salinity, the community based water resources advisory committee formed a working group to examine the issues in 1995.

The working group concluded that a 35% reduction of allocations was required to bring them in line with the sustainable yield. A public meeting in December 1995 adopted the proposal to reduce the allocations by 35%. The working group was asked to develop management options that would minimise the impact on irrigators.

After an abortive public meeting (April 1996) to consider the options, a workshop was held in July 1996, attended by two thirds of the licensees. The workshop developed an approach to implement a 35% reduction in each allocation, to be applied in the following irrigation season.

This was a voluntary approach agreed to by a majority of the users in recognition of the unsustainable use of the resource and the impact that salinity was having on their seed production and the likelihood of continuing detrimental impacts.

The issue has not been overly contentious to date. However, it has not gone far enough and reductions in water extraction still have to be made and monitoring of actual water extraction will need to be introduced. This will be contentious as the flood irrigators do not want to pay for meters or have to go a volumetric allocation. The next round of reductions is expected to have a substantial impact on the water users.

### McLaren Vale Prescribed Wells Area case example (SA)

Available information on the McLaren Vale Prescribed Wells Area (PWA) indicates that the recent rate of use (mainly for irrigation of vineyards and orchards) has been marginally in excess of the sustainable yield of the aquifer.

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<sup>2</sup> Salt recycling occurs where shallow groundwater is used for irrigation on the land above the groundwater. Evaporation removes the water, but the remaining salt is flushed back to the water table, increasing its concentration in the groundwater. It is not a problem at lower levels of groundwater extraction as the groundwater throughflow carries the concentrated water away. However, at high levels of extraction it cannot move away quickly enough. As the salinity of irrigation water increases, more water is required to ensure the salts are flushed away through the soil, exacerbating the problem of recycling.

In preparing a Water Allocation Plan for the PWA, the Onkaparinga Catchment Water Management Board researched the capacity of the aquifer and water requirements of the irrigated crops and engaged the local community in detailed consultation. The resultant plan incorporates a reduction in allocation for the majority of licensees but in two stages to allow time to adapt. Until July 2003, allocations will be at the upper limit of the estimated sustainable yield, reducing thereafter to a figure closer to the long-term sustainable level.

A contentious aspect of the plan has been a lower allocation limit for grapevines than for other crops, reflecting the higher water requirement of almonds, olives and the like. As the majority user group, grape-growers have taken exception to this. Nevertheless, an effect of the plan may be a progressive shift from other crops to grapes, especially as water conservation technologies for grapes are developed further. This trend will be reinforced by the plan's criteria concerning water transfers – which use the basic allocation for grapevines as a benchmark.

The response to the plan has been mixed, with the local community generally recognising the need for restraint but with individual licensees concerned and sometimes angry about the implications for their respective businesses. Likely outcomes are a greater focus on alternative water sources, such as treated sewage effluent, and more attention to aquifer storage and recovery.

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